

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Michael PONTOPPIDAN

Serial No:

Filed:

For: A DIRECT INJECTION TWO-STROKE ENGINE

**DECLARATION**

I, Andrew Scott Marland, of 11, rue de Florence, 75008 Paris, France, declare that I am well acquainted with the English and French languages and that the attached translation is a true and faithful translation of the replacement sheets of the international application, No. **PCT/FR2004/003400**.

All statements made herein are to my own knowledge true, and all statements made on information and belief are believed to be true; and further, these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any document or any registration resulting therefrom.



Date: May 2, 2006

Andrew Scott Marland



## CLAIMS

1. A direct-injection two-stroke engine having a cubic capacity of 125 cc at most and a combustion chamber (12) delimited by:

5           · a cylinder (6) having a longitudinal axis (X), at least one inlet port (7, 8) and at least one exhaust port (9);

          · a piston (4) having a substantially flat crown (4a) and moved along the longitudinal axis by a  
10       connecting rod (5) connected to a crankshaft (3); and  
          · a cylinder head (10) provided with a sparkplug (11) and an injector (20) adapted to spray a jet of liquid fuel under pressure into the combustion chamber along a jet injection axis (P) and with a jet diffuser  
15       angle  $\gamma$  from  $15^\circ$  to  $75^\circ$ ,

          wherein the combustion chamber (12) has a first diametral plane (P1-P1) containing the longitudinal axis (X) of the cylinder and centered on the exhaust port and a second diametral plane (P2-P2) perpendicular to said  
20       first diametral plane (P1-P1),

          the sparkplug (11) is in a first portion of the cylinder head extending from the second diametral plane (P2-P2) towards the inlet port (7),

          the injector (20) is disposed in a bore in the  
25       cylinder head (10) oriented along an axis (I) and in the first diametral plane (P1-P1) in a second portion of the cylinder head complementary to the first portion, and

          the jet injection axis (P) is at a first angle  $\alpha$  from  $30^\circ$  to  $70^\circ$  to a transverse plane (T-T) of the  
30       cylinder and a second angle  $\beta$  from  $+45^\circ$  to  $-45^\circ$  to the first diametral plane (P1-P1),

          which engine is characterized in that the jet injection axis (P) is at an non-zero angle  $\delta$  to said cylinder head bore axis (I),

35       in that a control system is adapted to command the commencement of injection of fuel when the crankshaft (3)

AMENDED SHEET

is at an angular position from 45° to 20° ahead of the angular position of closure of the exhaust port (9), and

5 in that the fuel injection pressure and the orientation of the jet injection axis (P) are determined as a function of the flow of the gases in the combustion chamber (12) to obtain a substantially stoichiometric air/fuel mixture in the region of the sparkplug (11) at the moment of ignition.

10 2. An engine according to the preceding claim, wherein injection of fuel begins when the crankshaft (3) is situated in an angular position from 40° to 30° ahead of the angular position of closure of the exhaust port (9).

15 3. An engine according to claim 1 or claim 2, wherein the fuel injection pressure is from 50 bars to 150 bars.

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